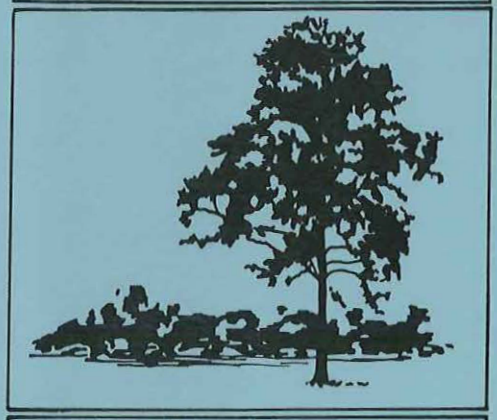

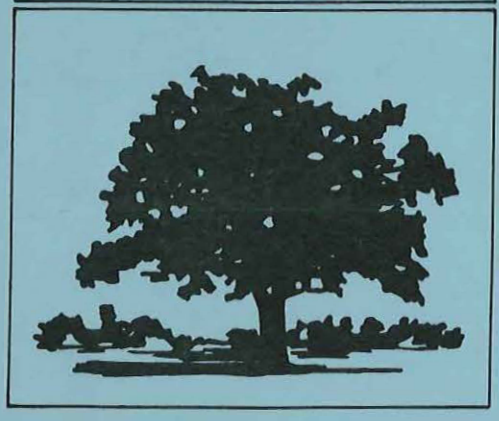

FOREST PEST CONDITIONS IN WISCONSIN

ANNUAL REPORT 1978

DEPARTMENT OF NATURAL RESOURCES
BOX 7921
MADISON, WISCONSIN 53707

FOREST PEST CONDITIONS IN WISCONSIN ANNUAL REPORT - 1978

Compiled and Edited by Donald W. Renlund
Supervisor, Forest Pest Control

DEPARTMENT OF NATURAL RESOURCES
Division of Resource Management
Bureau of Forestry

OUR MISSION:

To protect and enhance our Natural Resources —
our air, land and water;
our wildlife, fish and forests.

To provide a clean environment
and a full range of outdoor opportunities.

To insure the right of all Wisconsin citizens
to use and enjoy these resources in
their work and leisure.

And in cooperation with all our citizens
to consider the future
and those who will follow us.

Wisconsin
Dept. of Natural Resources

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PREFACE

1978 Annual Report

This record of the activities of forest pests and other destructive agents of growing trees in Wisconsin's forest nurseries, plantations, and natural timber areas was made possible by the dedicated work of pest management personnel in each district and at the Forest Pest Management Laboratory at Nevin Hatchery in Madison. DNR foresters, other department field personnel, cooperators in other public agencies and private forest industry contributed valuable assistance in monitoring the forest lands in all classes of forest ownership.

Preparation of the annual report is the result of the concerted efforts of staff personnel at the Pest Management Laboratory who prepared the final drafts and guided them through typing at the Madison Area office and the Southern District office. The finished product was prepared by the Bureau of Office Services.

Many thanks to all who have contributed to the report at any point along the way. Your help was appreciated.

Donald W. Renlund, Supervisor
Forest Pest Management

Department of Natural Resources
Forest Pest Control Personnel - January 1, 1979

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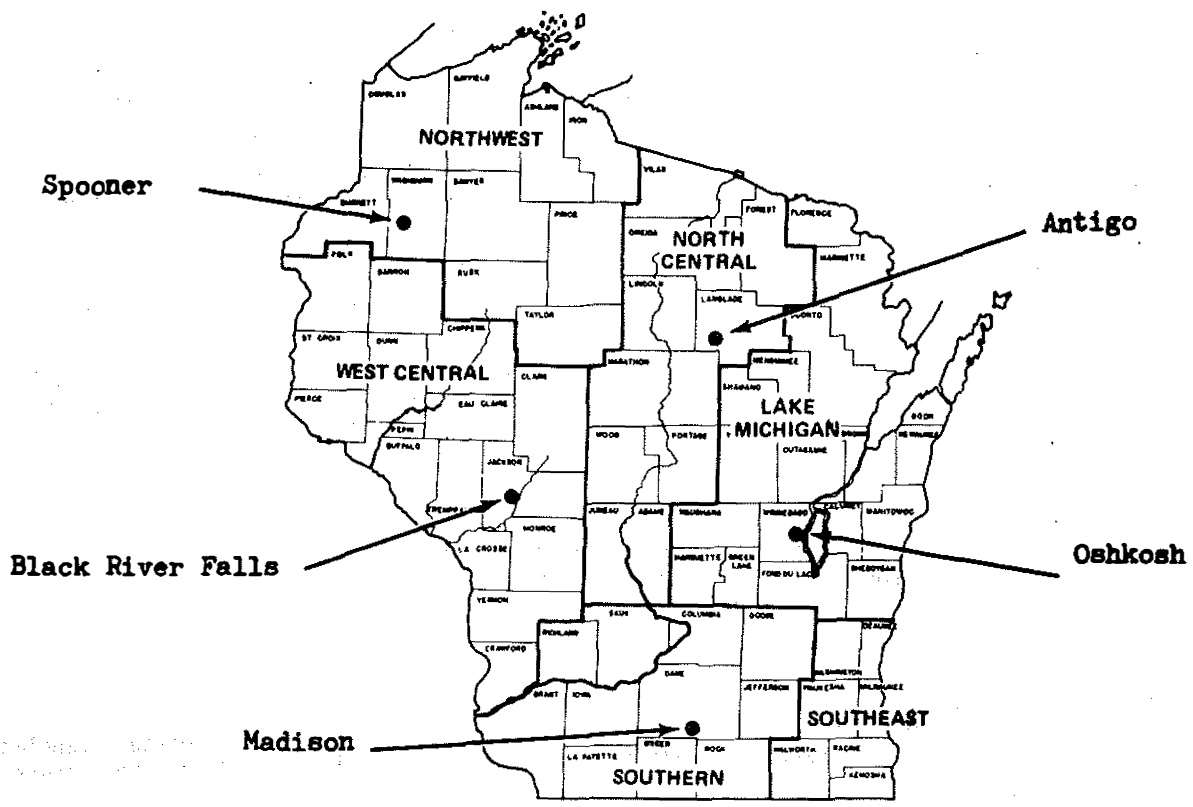

MAJOR FOREST INSECTS

COLEOPTERA

Twolined Chestnut Borer - *Agrilus bilineatus* (Weber)
Widespread oak mortality occurred again (Figure 1) with increased occurrence in the west central and northeastern counties and somewhat decreased incidence in the southern counties. In Marinette and Florence counties, mortality was most severe on rocky outcrops. Dead trees were common on west facing slopes in Eau Claire, Trempealeau and Jackson counties in August. Heavy mortality occurred in pockets on the Southern Unit of Kettle Moraine State Forest following heavy defoliation by cankerworms.

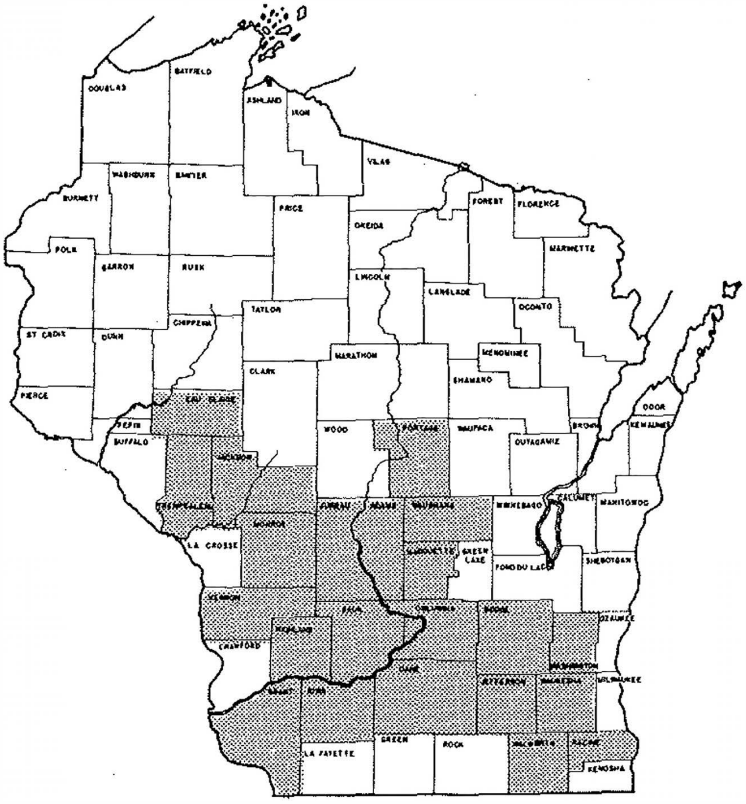

Figure 1. County distribution of twolined chestnut borer and widespread oak mortality.

An Oak Twig Borer - *Agrilus* sp.
In August, brown clusters of 3-5 leaves on black and white oaks became numerous; black oaks were more affected than white oaks. The intensity ranged from 2 or 3 clusters per tree to as much as 50% of the foliage. In woodlots the clusters were distributed in the tops throughout the stand. Individual open-grown trees were most heavily affected. The condition was noted in all but the northern ¼ of Wisconsin.

Dissection revealed *Agrilus* larvae boring in the inner bark and outer xylem.

White Pine Weevil - *Pissodes strobi* (Peck)
Generally very light populations except for heavily attacked Norway spruce plantings in Sauk and Langlade counties. The southern edge of its range in Wisconsin was through northern Sauk County. In this area the weevil was present in about half the white pine plantations observed and attacked about 1 percent of the tree terminals in these plantations.

Phenology:
May 16 - Adults present in Langlade County.
June 22 - Late larvae and prepupae present in Menomonee County white pine.
August 2 - Adults began emerging from Norway spruce in Jackson County.
August 17 - Most of adults emerged in Jackson County.

DIPTERA

Balsam Gall Midge - *Paradiplosis tumifex* Gagné
Locally heavy infestations continued in natural balsam fir stands on 2,000 acres in northeastern Langlade and southern Forest counties. Heavy infestations occurred on 1,200 acres of balsam fir Christmas trees in Langlade, Lincoln, Forest and Oneida counties.

Tests of systemic insecticides were conducted in cooperation with U.W. Department of Entomology. For results see Benjamin and Banash 1978.

Red Pine Needle Midge - *Thecodiplosis piniresinosae* Kearby
Scattered pockets of medium to heavy browning of red pine foliage occurred in windbreak and forest plantings in Columbia, Marquette, Adams, Juneau, Jackson, Clark, Wood, Portage, Marathon, Langlade and Oneida counties. A heavily attacked planting in Marquette County (S12, T15N, R9E) was lightly attacked at the edges in 1977.

HOMOPTERA

Saratoga Spittlebug - *Aphrophora saratogensis* (Fitch)
One thousand acres of red pine plantings were surveyed on state forest lands in Oneida County. Nymphal populations were high on alternate host plants and some flagging was apparent on the pines on 260 acres. This area was treated with an aerial application of 10 fluid ounces of cythion per acre. This reduced adult populations to near zero.

HYMENOPTERA

Red Pine Sawfly - *Neodiprion nanulus nanulus* Schedl
Populations erupted in Columbia County where moderate to heavy defoliation occurred in several red pine plantations. Nearly complete defoliation of old needles occurred in two small plantings. A growing population was observed in planted red pine near Arena in Iowa County.

Phenological Notes:
May 18 - Eggs 80% hatched in Columbia County.
May 25 - 25% 1st instar, 50% 2nd, 25% 3rd near Arena.
June 7 - A few larvae left on trees; most have dropped to ground in Columbia County.

European Pine Sawfly - *Neodiprion sertifer* (Geoffroy)
The population on the Kettle Moraine State Forest - Southern Unit and on surrounding private land increased greatly causing heavy defoliation to 8-15 year old planted red pine. Heavy defoliation continued in Racine County where a 15 year old red pine stand was heavily defoliated for the fifth straight year. Heavy defoliation occurred in several red pine plantings in Lafayette County where no infestations had been reported previously. A Christmas tree grower in Grant County sprayed malathion on several hundred Scotch pine to prevent heavy defoliation. New, light infestations were detected in several locations in Green, Lafayette and Grant counties.

Phenology:
May 17 - Eggs 50% hatched in Walworth County.
May 25 - 15% 1st instar, 50% 2nd, 35% 3rd in Grant County.
June 5 - Larvae in 4th, 5th and 6th instars in Green and Lafayette counties.
June 8 - Larvae in last feeding instar with a few prepupae wandering in Walworth County.

Larch Sawfly - *Pristiphora erichsonii* (Hartig)
Defoliation of tamarack was generally greater than in 1977 but variable. Light to severe defoliation could be found in most areas of the state. Pockets of heavy defoliation were concentrated in Forest, Langlade, Lincoln, Marathon, Oneida, Shawano, Oconto, Marinette and Florence counties. Little tree mortality has been attributed to this sawfly.

LEPIDOPTERA

Spruce Budworm - *Choristoneura fumiferana* (Clemens)
The area covered by the northeastern outbreak remained stable at about 140,000 acres (Figure 2). This accounts for most of the spruce-fir type in northeastern Wisconsin. The heaviest defoliation occurred in eastern Oneida, eastern Vilas and all of Forest County. Light to moderate defoliation occurred in northeast Langlade, northeast Lincoln and western Oconto and Marinette counties. Heavy defoliation in 25 to 35 year old white spruce plantations has increased so that a few dead tops are beginning to appear.

An egg mass survey produced an average of 1.15 egg masses per 15 inch branch - down from 1.93 in 1977. Egg parasitism dropped from 13% in 1977 to 3.4% in 1978.

In northwestern Wisconsin, light to moderate defoliation occurred in northern Sawyer, Bayfield (Section 35, T44N, R8W), and on 1200 acres of spruce-fir type in Iron County. Egg numbers continued to decrease in all plots so there should be less defoliation in most stands in 1979.

Jack Pine Budworm - *Choristoneura pinus* Freeman
Budworm populations erupted to epidemic levels on about ten thousand acres of jack pine in eastern Burnett County (T42N, R14W) and southwestern Washburn County (T42N, R13W). Severe defoliation occurred in many of these stands and there will be some tree mortality. Pupal and egg counts indicate a movement of this outbreak to the east and north, and moderate to severe defoliation could occur on about 30,000 acres of jack pine in 1979.

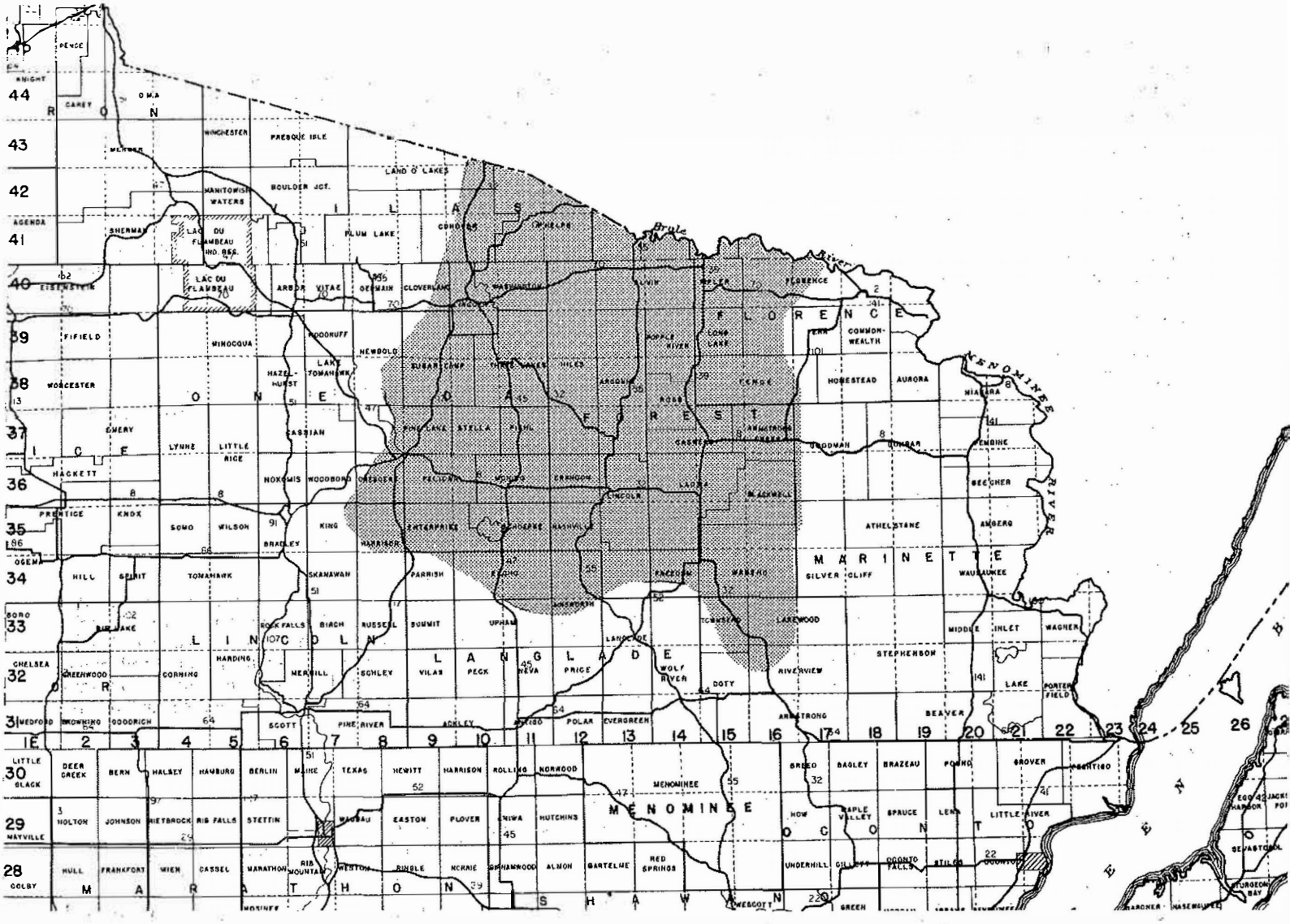

Figure 2. Area of moderate to severe spruce budworm defoliation in northeastern Wisconsin, 1978.

Phenological Notes:

May 17 - Larvae starting to break hibernation in Washburn and Douglas Counties. Jack pine leaders 2" to 6" long. Oak buds starting to open. Pollen yellow-green and hard.
May 24 - Larvae still 2nd instar. Pollen ripe and blowing in Douglas and Bayfield counties. Heavy from Minong north and east. Jack pine leaders 3" to 8" long.
June 7 - Larvae 2nd and 3rd instar in Washburn and Douglas counties. Webbing showing up.
June 12 - Larvae mostly 3rd instar, some 4th in Douglas County.
June 20 - Larvae mostly 4th instar, some 5th in Washburn and Douglas County.
June 21 - Pupation starting in southern Burnett County.
June 26 - Pupation starting in Douglas County.
July 6 - 90% pupated.
July 12 - Pupation completed, some adults present.
July 26 - Oviposition 90% complete - some eggs hatching.

Zimmerman Pine Moth - *Dioryctria zimmermani* (Grote)
Heavy shoot damage occurred in 220 acres of 25 year old red pine plantings in Jackson County (S2, 10, T20N, R2W; S35, 36, T21N, R2W; S28, 29, T24N, R6W). Annual height growth loss is estimated to be 5-10%. Damage has been occurring in some plantations for at least 3 years so that edge trees are becoming stunted.

Gypsy Moth - *Lymantria dispar* (L.)
Two infestations are known to occur in Wisconsin. East of Oconomowoc, 643 adult males were trapped with (+) disparlure baited traps placed in a grid at ¼ mile intervals. The infestation occupies about 400 acres bordering both Oconomowoc and Okauchee Lakes. It is generally a wooded residential area. An egg survey yielded 80 egg masses, many containing 1000 or more eggs. Many egg masses were found under loose bark on black willow, shagbark hickory, and sugar maple. Most of the egg masses were located more than 4 feet from the ground.

More than 328,000 adult *Ooencyrtus kuwanai* (Howard) were released during August and September (See Appendix I).

In Appleton, 21 moths were caught in a 10 acre infestation that was trapped with 84 (+) disparlure-baited traps per square mile. No eggs were found.

A detection survey conducted by USDA Animal and Plant Health Inspection Service covered all or parts of 36 counties (Figure 3). Traps baited with racemic disparlure were placed in an approximate grid at one trap per 3 square miles. Additional traps were placed in parks and recreational areas by DNR and Wisconsin Department of Agriculture. Single male gypsy moths were caught on the east side of Madison and at Devil's Lake State Park in Sauk County.

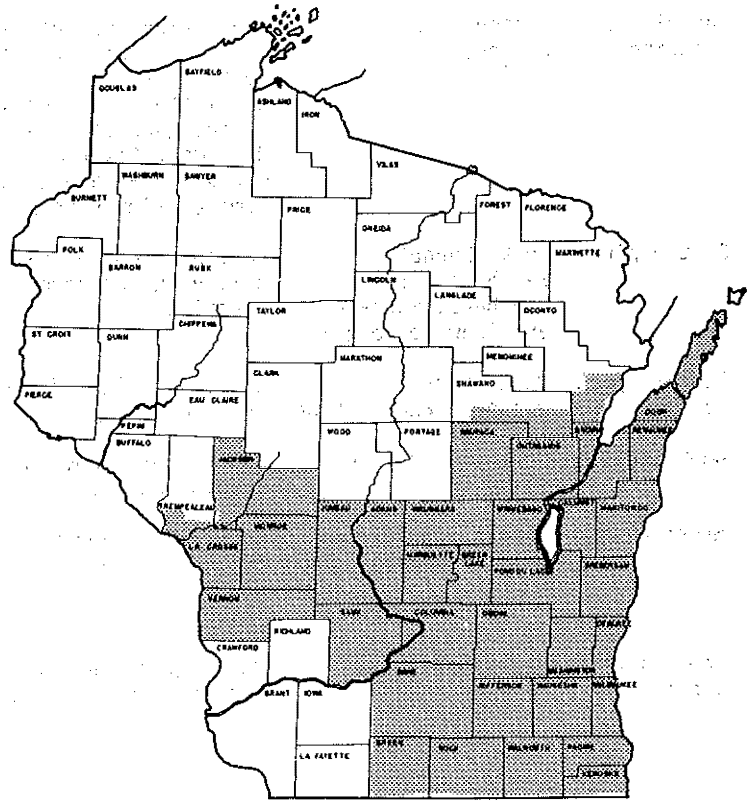

Figure 3. Gypsy moth detection survey - 1978.

Eastern Tent Caterpillar - *Malacosoma americanum* (Fab.)
High populations continued in the southern third of Wisconsin where the second consecutive year of heavy defoliation caused mortality in some of the smaller roadside *Prunus* species. Numerous tents were noted at various scattered locations in the northern two-thirds of the state also.

Forest Tent Caterpillar - *Malacosoma disstria* (Hubner)
The outbreak in central Douglas County (T46 and 47N, R10 and 11W) collapsed. Many larvae hatched before leaf buds opened and apparently starved. New outbreak populations were discovered in western Douglas and northeastern Bayfield counties where a total of 27,000 acres of aspen and oak suffered light to moderate defoliation.

OTHER INSECTS

Insect	Host(s)	Location	Comments
COLEOPTERA			
Bronze Birch Borer *Agrilus anxius* (Gory)	White birch	Northern half of state	Mortality common and scattered in forest stands.
Pine Engraver *Ips pini* (Say)	red pine and jackpine	Northern half of Wisconsin	Populations generally very low. Some red pine mortality near log decks in North Central District. Some budworm-defoliated jackpine were killed by second generation engraver beetles in Northwest District. Little or no pine mortality adjacent to fire and wind damaged timber in Northwest District.
Pine Root Collar Weevil *Hylobius radicis* Buchanan	Scotch pine	Polk, Burnett, Washburn, Grant, Waushara, Waupaca and Shawano counties	Continued concentrations of tree mortality in untended, Christmas tree plantings.
Pine Root Tip Weevil *Hylobius rhizophagus* Millers	Scotch, jack, red pine	Polk, Burnett, Washburn and Jackson	Continued light flagging and occasional tree mortality in known infestations.
Elm Bark Beetles *Hylurgopinus rufipes* (Eichoff)	American elm	Northeastern ¼ of state	High populations observed during summer logging operations.
Scolytus multistriatus (Marsh)	American elm	Forest, Oneida and Vilas counties	No beetles caught with two pheromone traps in each county.
DIPTERA			
Poplar Twig Gall Fly *Malanagromyza schineri* (Giraud)	trembling aspen	Jackson County	One to ten year old reproduction on iron mine tailings lightly attacked.
HOMOPTERA			
Pine Tortoise Scale *Toumeyella numismaticum* Pettit and McDaniel	jack pine	Northern half of state	Generally light populations; heavy populations on a few trees in Jackson County.
HYMENOPTERA			
Introduced Pine Sawfly *Diprion similis* (Hartig)	white pine	Northern two-thirds of state	Very low populations.
Birch Leafminer *Fenusa pusilla* (Lepeletier)	white birch	Northern two-thirds of state	Very heavy populations in scattered locations in forest and ornamentals.
Redheaded Pine Sawfly *Neodiprion lecontei* (Fitch)	jack pine	Northern two-thirds of state	Very low populations; a small high population observed in Outagamie County.
White Pine Sawfly *Neodiprion pinetum* (Norton)	white pine	Waupaca County	Small pocket of heavy defoliation, otherwise very light.
Redheaded Jack Pine Sawfly *Neodiprion rugifrons* Middleton	jack pine	LaCrosse County	Single small infestation.
Swaine Jack Pine Sawfly *Neodiprion swainei* Middleton	jack pine	Trempealeau County	Severe defoliation in a windbreak.
Yellowheaded Spruce Sawfly *Pikonema alaskensis* Rohwer	spruce	Washington Island, Door County	Pockets of noticeable defoliation.
LEPIDOPTERA			
Fall Cankerworm *Alsophila pometaria* (Harris)	oak, cherry, soft maple	Dane, Jefferson, Walworth, Waukesha	Pockets of heavy defoliation common.

Insect	Host(s)	Location	Comments
Orangestriped Oakworm *Anisota senatoria* (J. E. Smith)	oak	Portage	A pocket of heavy to complete defoliation of individual trees.
Oak Webworm *Archips fervidanus* (Clemens)	oak	Douglas, Washburn, Burnett counties	Webs numerous in stands where jack pine budworm populations were high.
Oak leafroller *Archips semiferanus* (Walker) and Oak leaf tier *Croesia semipurpurana* (Kearfott)	red oak, northern pin oak	Menominee County	Populations very low, light defoliation near Loon Lake.
Large Aspen Tortrix *Choristoneura conflictana* (Walker)	aspen	Central Langlade County	Several pockets of heavy defoliation of young aspen.
Pine Tussock Moth *Dasychira pinicola* (Dyar)	jack pine, red pine	Northwest District	A few scattered larvae and no eggs were observed.
Walnut Caterpillar *Datana integerrima* Grote & Robinson	black walnut	Columbia, Winnebago, Jefferson, Iowa and Rock counties	Heavy to complete defoliation of individual trees common.
Saddled Prominent *Heterocampa guttivitta* (Walker)	sugar maple, beech	Door County	Population decline continued, the only observable defoliation was at Newport Beach State Park.
Aspen Blotchminer *Phyllonorycter tremuloidiella* (Braun)	trembling aspen	Vilas, Forest, Oneida and Langlade counties	Pockets of heavy defoliation.
		Outagamie County	Pockets of light defoliation.
ORTHOPTERA			
Oak Grasshopper *Dendrotettix quercus* Packard	oak	Jackson and Clark counties	Grasshoppers were observable but no noticeable defoliation.
Walkingstick *Diapheromera femorata* (Say)	hardwoods	Northern half of state	Very low populations; no noticeable defoliation.

PUBLICATIONS

Benjamin, D. M. and Stanley E. Banash
1978. Selected chemicals for control of the balsam gall midge in Wisconsin Christmas tree plantations. Univ. of Wis. For. Res. Note No. 215.

Benjamin, D. M., Stanley E. Banash and James R. Hanson
1979. Carbofuran and Fenitrothion show promise in control of balsam gall midge defoliation. Univ. of Wis. For. Res. Note No. 221.

MAJOR FOREST DISEASES

WILTS AND DIEBACKS

Dutch Elm Disease - *Ceratocystis ulmi* (Buisman) Moreau
Dutch elm disease continues to be the major forest disease problem in Wisconsin. Approximately 50% of the elms in Wisconsin forests died between 1956-78. Utilization of diseased elm has been used to minimize economic loss from the disease. Approximately 500 million cubic feet of elm died from 1968-78, but almost 200 million cubic feet were salvaged.

Wisconsin municipalities spent $3.7 million in 1976 to control Dutch elm disease. This past year 19 Wisconsin communities participated in a $275,000 Dutch elm disease control demonstration program that was sponsored by the U.S.D.A. - Forest Service. This program is expected to continue for another four years.

Oak Wilt - *Ceratocystis fagacearum* (Bretz) Hunt
There was no change in the state-wide distribution of oak wilt in 1978 (Figure 4).

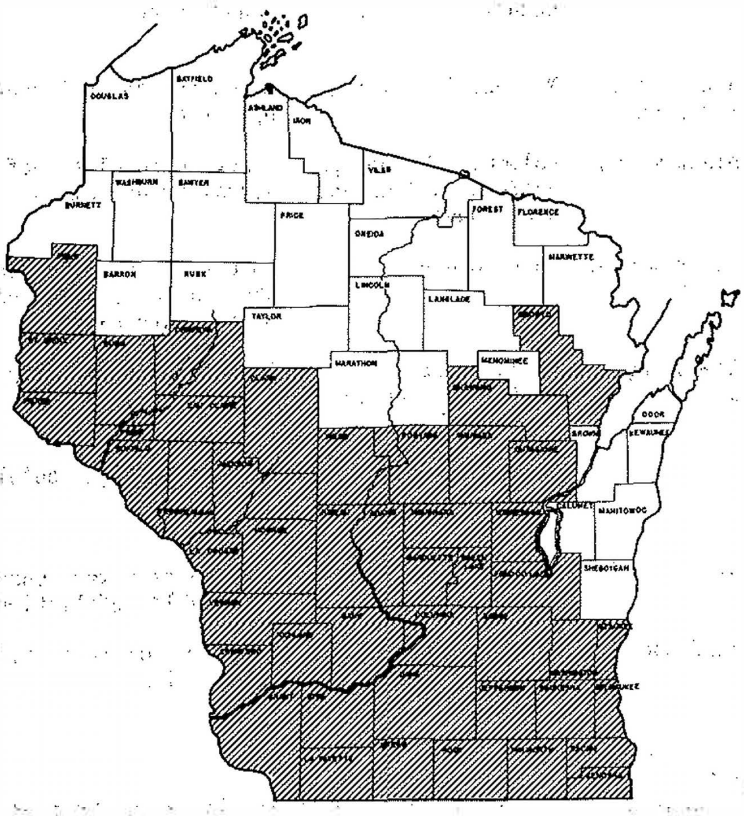

Figure 4. Known Distribution of Oak Wilt in Wisconsin - 1978.

STEM AND BRANCH DISEASES

Butternut Canker - *Sirococcus* sp.
Widespread dying of butternut was first reported in Grant County in 1967. A state-wide disease impact survey in 1976-77 revealed the presence of the disease in 18 counties in southern and western Wisconsin (Figure 5). Trees of all ages and sizes growing in mixed or relatively pine stands, on dry infertile ridgetops or moist, fertile bottomlands are cankered. Within some survey plots, 80% of the trees were cankered and 32% were dead. The few remaining apparently healthy butternut trees within infected sites are being tagged and will be used for selecting disease resistant stock. The canker-inciting fungus was identified as *Sirococcus clavigignenti--juglandacearum* sp. nov. by University of Wisconsin pathologists in 1978. A butternut field day was organized by the North Central Forest Experiment Station and Forest Pest Control Unit, Wisconsin Department of Natural Resources on May 26, 1976 near Blue Mounds, Wisconsin. The objective was to use a multi-discipline approach to study the cause, distribution, impact and control of butternut canker. Twenty-five people divided into teams to dissect and record insect and disease information on eight trees (Table 1). A second field day was held on May 18, 1977 at the Coulee Experimental Forest near La Crosse where five trees were dissected (Table 2). Additional field days were held at La Crosse on April 5, 1978 and in Dunn County on May 24, 1978 (Table 3).

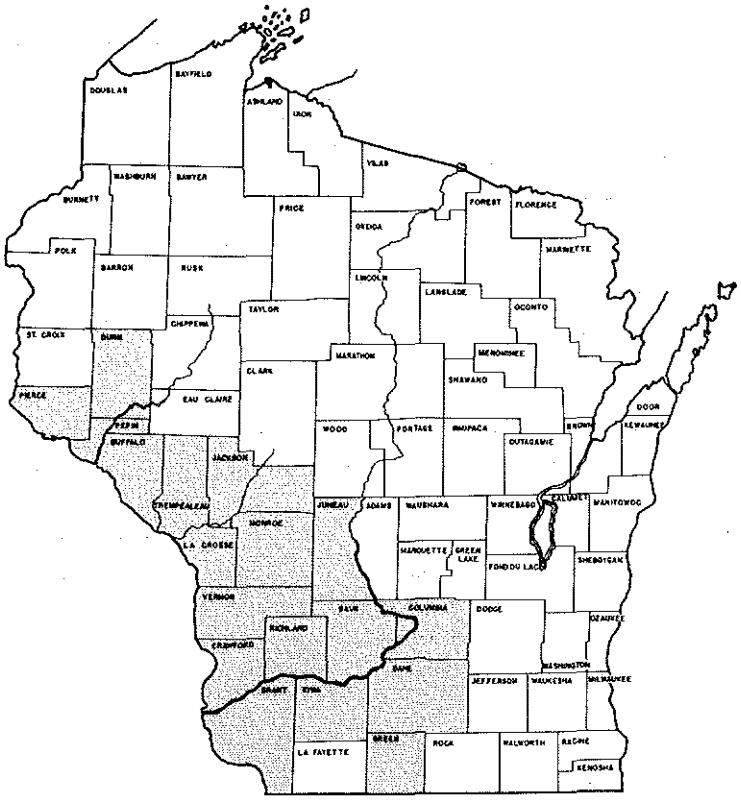

Figure 5. Known County Distribution of Butternut Canker in Wisconsin - 1978.

Table 1. Results from dissection of butternut trees near Blue Mounds, Wisconsin, May 26, 1976

Some statistics on the trees dissected are as follows:

Tree	DBH	Ht.	Age	% Crown Dead	# Healthy Branches	# Cankered Branches	# Dead Branches	# Trunk Cankers
					SITE 1			
1	2	10	20	40	10	20	34	16
2	4	22	20	5	13	0	1	0
3	3	19	22	50	11	9	6	Cankers coalessed
4	3	23	--	10	1	18	4	3
5	5	25	30	20	Many	Numerous	18	21
6 Black Walnut	3	19	15	1/4 of lower crown	13	0	6	0
					SITE 2			
1	8	41	40	40	12	7	14	50+
2	6	43	26	50	0	6	3	63

Table 2. Results from dissection of five butternut trees on the Coulee Experimental Forest, La Crosse County, Wisconsin, May 18, 1977.

Tree	D.B.H.	Height	Age	Crown dead	Healthy branches	Cankered branches	Dead branches	Trunk cankers	Age of oldest canker examined	Average number cankers/ branch
Number	Inches	Feet	Years	Percent	Number	Number	Number	Number	Years	Years
1	4.7	25	21	10	6	8	9	33	5	5
2	3.2	21	15	75	0	10	5	46	4	9
3	4.2	26	20	60	1	19	10	57	6	6
4	3.8	23	20	20	6	20	21	39	6	2
5	4.7	26	16	0	12	0	4	0	-	0

Table 3. Results from dissection of three butternut trees in La Crosse County (Tree Nos. 1-3) and Dunn County (Tree Nos. 4-6), Wisconsin, Spring, 1978.

Tree	D.B.H.	Height	Age	Trunk cankers	Age of oldest canker examined
Number	Inches	Feet	Years	Number	Years
1*	2.5	23	13	36	5
2	2.2	19	12	33	5
3	4.4	29	23	109	7
4	5.0	49	24	1**	5
5	4.8	47	26	52	11
6	8.2	53	32	73	12

* This tree appeared to have some resistance as many cankers were healed over or walled off.
** Many small cankers present near top of tree on small branches.

The Forest Pest Control Unit continued to cooperate with Professor James E. Kuntz, University of Wisconsin-Madison on a study of the etiology, distribution, and impact of butternut canker. The results were presented at the 3rd International Congress of Plant Pathology, Munich, Germany, 16-23 August 1978. The following is an abstract of the presentation;

KUNTZ, J. E. and PREY, A. J. (University of Wisconsin and Department of Natural Resources, Madison, Wisconsin, USA)

Etiology, Distribution, and Impact of Butternut Canker in Eastern USA

Widespread dying of butternut (Juglans cinerea L.) first was reported in Wisconsin in 1967. Canker-dieback thereafter has been found throughout the range of butternut. Trees of all ages and sizes, growing in mixed or relatively pure stands, on dry infertile ridgetops or moist, fertile bottomlands are cankered. Young branch cankers are discrete, fusiform, and originate at leaf scars, buds, and various wounds. Older branch and stem cankers are large, open, vertical, perennial, with shredded bark and blackened wood, often bordered by successive callus layers. Single or coalescing cankers girdle branches causing dieback, and stems causing tree death. Branch suckers and trunk sprouts commonly develop, are infected, and die. Under the outer bark, the fungus pathogen, tentatively identified as Sirococcus sp., forms a thin, black stroma bearing hyphal pegs and globose to flattened, single or confluent pycnidia. Hyaline, two-celled, fusiform conidia are extruded in sticky masses and are disseminated by splashing or blowing rain or mist. The disease has been detected infrequently on black walnut (J. nigra L.), but artificial inoculations incite cankers on seedlings and saplings.

Scleroderris Pine Canker - *Scleroderris lagerbergii* Grem.
Red pine plantations surveyed for Scleroderris canker on non-federal lands in Douglas and Bayfield counties in 1967 were reexamined in 1976-77. One new infected plantation was found near Iron River, Wisconsin, in Bayfield County. There are presently nine infected red pine plantations on non-federal lands in Wisconsin. Four plantations are in Bayfield County, the other remaining are in Vilas County. Serological testing of culture from two locations in Bayfield County and one from Vilas County indicate the presence of the Lake States strain of *S. lagerbergii*. Surveys will be made annually in Bayfield and Vilas counties at present and potential infection sites.

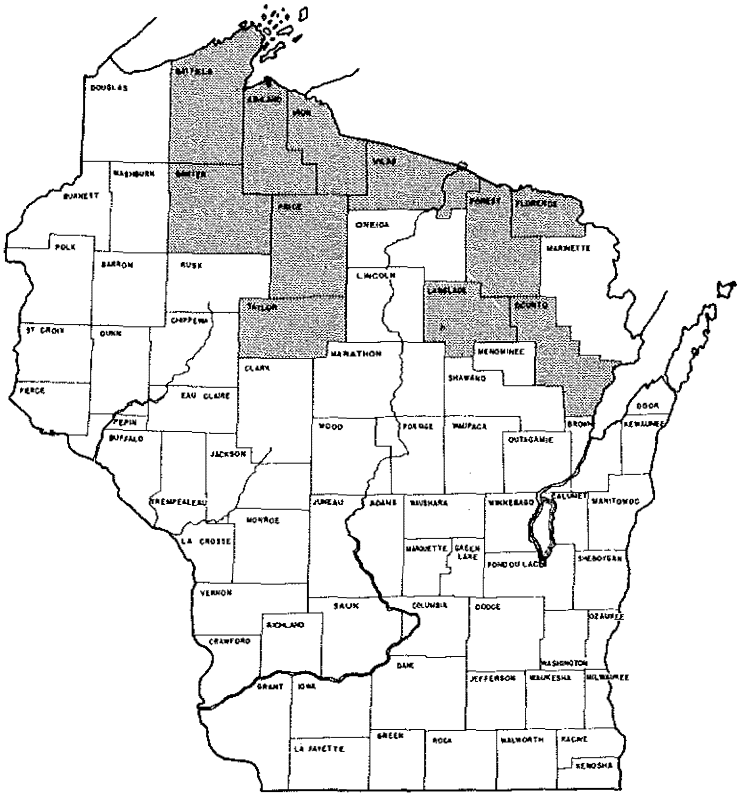

Figure 6. Known County Distribution of Scleroderris Pine Canker in Wisconsin - 1978.

Diplodia Pine Canker - *Diplodia pinea* (Desm.) Kilk
Red and Jack pine plantations infected with *Diplodia pinea* are found in Adams, Bayfield, Burnett, Douglas, Green, Jackson, Richland and Wood counties. Many trees known to be infected in 1976 died but infection has not spread to adjacent trees even though spores of *D. pinea* were trapped adjacent to infected trees. Studies on spore discharge are being conducted in Green, Jackson and Douglas counties in cooperation with the North Central Forest Experiment Station. Results indicate that rainfall was required for spore discharge with major spore dispersal occurring from May-July at all three sites (Figure 8). Spore traps within a native jack pine stand near Shamrock, Wisconsin (Figure 9) revealed that spore discharge peaked at the same time as in an adjacent red pine plantation near Shamrock (Figure 8).

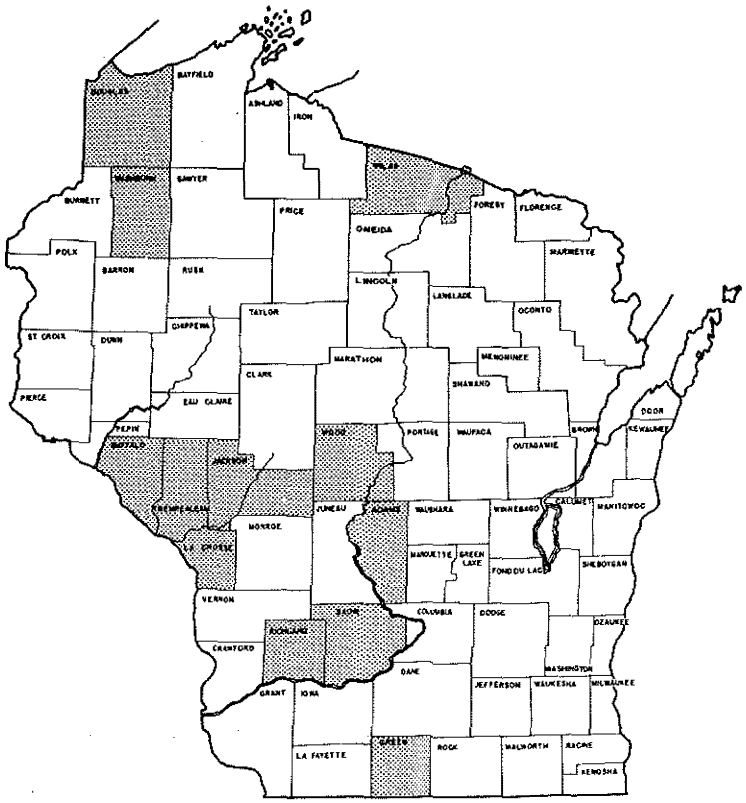

Figure 7. Known County Distribution of *Diplodia pinea* in Wisconsin - 1978.

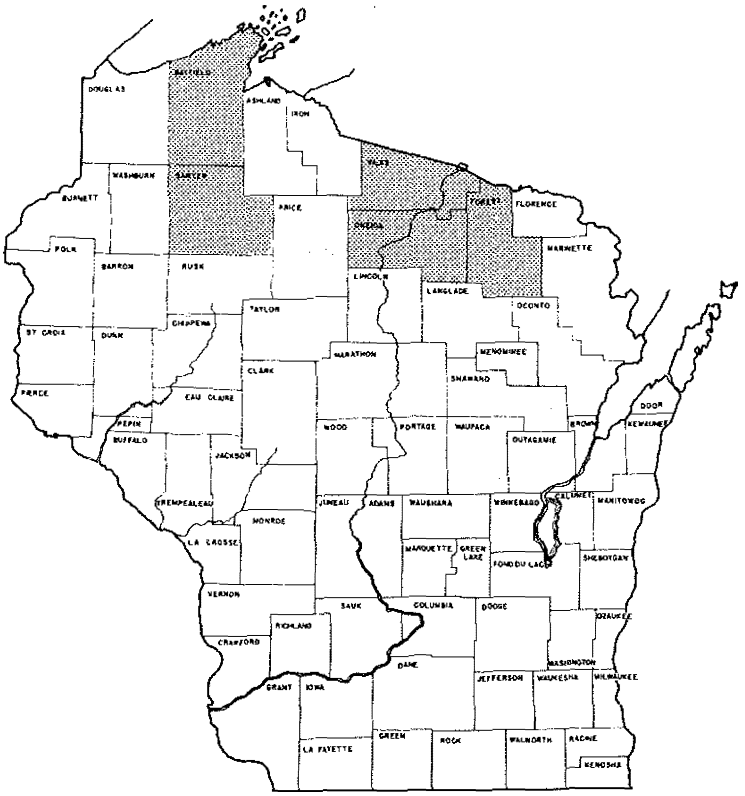

Figure 10. Known County Distribution of Red Pine Shoot Blight in Wisconsin - 1978.

Table 4. Cumulative Tree Mortality, Starrett Lake Red Pine Shoot Blight Plot, Northern Highland State Forest, Vilas County, Wisconsin (Sec. 24, T41N, R7E).

Year	Openings (%)	Understory (%)
1972	0	20
1973	0	31
1974	0	45
1975	0	59
1976	0	63
1977	0	67
1978	0	76

Plot totals: number of trees in openings - 49
number of trees in understory - 51

FOLIAGE DISEASES

Aspen Bronzing - Unknown
An unusual phenomenon has been observed on large-tooth aspen in Wisconsin the past six years. At 20-30 locations throughout the state, leaves on individual trees will turn yellow in July or August and within 10-20 days become golden bronze to brown. The remaining leaves on the rest of the tree remain green and healthy. When normal fall coloration occurs, leaves on affected branches are a dark brown with yellow petioles, while unaffected leaves are yellow. Examination the following year reveals that branches bearing bronze leaves are dead. The number of bronze leaf bearing branches increases each year until the tree dies. No insects or fungi are associated or isolated from the bronzed branches or leaves. Studies are underway at the University of Wisconsin to determine if the leaf bronzing is caused by a virus.

Aspen Leaf Spot - *Venturia* sp.
Defoliation of large-tooth aspen clones started in July in West Central Wisconsin from Black River Falls to Eau Claire - particularly in Eau Claire, Jackson and Trempealeau counties. There was also reports of defoliation later in the summer from Langlade and Menominee counties. Infected trees were not killed but will be observed in 1979.

Basswood Anthracnose and Leaf Spot - *Asteroma tiliae* Rud.
Anthracnose and leaf spotting were prevalent on basswood throughout northern Wisconsin in August. Defoliation was most serious in Iron, Rusk and Washburn counties. A fungus tentatively identified as *Asteroma tiliae* was isolated, but other fungi such as *Gnomonia tilieae* may also be involved.

Hickory Anthracnose - *Gnomonia caryae (Leptothyrium caryae)*
Leaf anthracnose was common on shagbark hickory in southern Wisconsin in August. Many of the trees were severely infected they were completely brown and looked dead. However, the buds of infected trees were healthy and no mortality was recorded.

Douglas Fir Needlecast - *Rhabdocline pseudotsugae* Syd.
Rhabdocline pseudotsugae was collected for a Douglas fir Christmas tree plantation in northern Bayfield County (NW, NE, S17, T51N, R5W). This is the first report of Rhabdocline in Wisconsin. Approximately 70% of the Christmas trees were unmerchantable, so the grower applied one mistblower application of the fungicide BRAVO. Effectiveness will be evaluated later this year. This is one of the few Douglas fir plantations in Wisconsin and is remote from other Douglas fir. It appears the disease was introduced on infected nursery stock.

White Pine Needle Blight - Atmospheric gases
White pine needle blight which can be caused by atmospheric gases such as ozone or sulfur dioxide was observed in Richland, Sauk and Green counties in July. Approximately 1% of the trees in 10-20 year old plantations were affected. There were no significant losses in pine plantations grown for timber but affected Christmas trees were unmerchantable.

ROOT ROTS

Nursery Seedling Loss - Unknown
Damping-off, stunting of seedlings and needle abortion, all of unknown cause, were major problems in white pine and red pine seed beds in the State Forest Tree Nurseries at Boscobel, Hayward and Wisconsin Rapids. Losses ranged from 10% to 20% of the original seeding. Univeristy of Wisconsin pathologists have investigated the problem, but to date no specific pathogen or other causal agent has been found.

OTHER

Air Pollution
The Forest Pest Control Section was involved in surveying and evaluating air pollution damage in the cities of Berlin, Park Falls, and Superior. At Berlin, injury typically caused by sulfur dioxide was recorded on sycamore, Siberian elm, silver maple, concord grape and ferns. In Park Falls, injury from sulfur dioxide was observed on Scotch pine, white birch, flowering crab, apple, garden plants and flowers. In Superior, injury resembling fluoride damage was observed on willow, clover and herbaceous weeds. The source of the damage is being investigated at locations by the DNR Air Pollution Control Section.

Winter Injury
Short-needle varieties of Scotch pine had more than the normal amount of winter-burned foliage in central Wisconsin this past spring. Injury was most severe in Christmas tree plantations in Adams, Jackson, Washara and Wood counties. One grower in Jackson County had over 100,000 trees affected.

Maple Decline and Mortality - Unknown
A considerable number of pole-sized maples were killed in small groups on 80 acres of forest lands in Forest County. Trees appeared to have been dying for at least two years or more with a few having epicormic branching close to the ground. Drought conditions in the 1975-76 years and root rot may have attributed to the stand condition (Sec. 18 & 30, T38N, R14E).

Maple dieback was also observed in farm woodlots in northwestern Clark Co. (SWSW, Sec. 36, T28N, R3W and Sec. 12, T27N, R3W). Trees 18"-24" d.b.h. had dead or dying branches and appear to have been declining the past three years. Understory trees and shrubs were not affected.

Similar dieback was reported in southeastern Chippewa County.

Pine Grosbeak - *Pinicola enucleator L.*
A few Christmas tree growers in central Wisconsin counties reported serious debudding of Scotch pine by grosbeaks which moved into their area during the winter of 1978. The birds appear to favor sheared trees and are particularly destructive of buds in the upper 1/5 of the crowns.

Loss of buds ranging from 59% to 76.8% were reported in February and March of 1978, and all Scotch pine plantations examined showed some injury by the birds.

Meadow Vole - *Microtus pennsylvanicus*
High overwintering populations and heavy snow cover forced the mice to feed on bark of many woody plants. In Grant County, 7,000 3-year old Scotch pine Christmas trees were girdled.

Appendix I

Biological Control Program

David Hall

I. Parasite Survey

From 1974 through 1977, the objective of the parasite survey was to explore the forested area of Wisconsin for parasites of forest insects. A wide variety of species of host insects were collected and reared; most were defoliators. Hundreds of thousands of specimens were collected in Malaise traps. Publication of some of the information gained was reported in the 1977 annual report. Much analysis of the data remains to be done.

The focus of the survey changed in 1978 for several reasons: the personnel at the UW were no longer available to handle the large volume of material produced; it was recognized that four year's data was probably adequate; and complete listing of all species parasitic upon forest insects was clearly impossible.

The new objectives of the survey are to determine the distribution of selected natural control agents and to determine the complex of natural control agents of specific pests.

A. Collections - A total of 4785 immatures were collected for rearing in areas that supported moderate to heavy populations. An occasional local infestation provided opportunity to make unplanned collections and rearings. Very low host populations in parasite release areas made some planned collections not feasible.

B. Rearing - Because most of the collections were made in large numbers, most of the rearing was done in cages. The pine sawflies were reared in paper grocery bags. Less than 500 of the immatures were individually reared in 1-oz. plastic cups.

C. Adult Identification - Very few new names of hosts and parasites have been returned since the last report. The parasite survey data from years 75-77 was placed on computer tape for analysis.

No specimens of species released in Wisconsin from 1973 to 1977 were recovered in 1978.

II. Parasite Release

When the scope of the gypsy moth infestation in Oconomowoc became evident in late July, the decision was made to release the egg parasite, *Ooencyrtus kuwanai* (Howard) in the area. About 3,000,000 gypsy moth eggs, 10-20% parasitized, were field collected in Pennsylvania by personnel of the Pennsylvania Forest Pest Management Division and shipped to the pest control lab in Madison. The eggs were placed in rearing boxes in the lab. By manipulating the light source, the emerging adult parasites were induced to move into the attached plastic bags. The parasites were extracted several times per week and taken immediately to Oconomowoc. The plastic bags containing the parasites were tacked upon the larger trees and opened at both ends and left in place until the adult parasites had emerged.

From August 24 to October 2, about 328,400 parasites were released. Temperatures, humidity, wind and sunlight varied greatly among releases.

It was expected that those released before the middle of September would search for and attack eggs and those released later would tend to seek out overwintering locations down in the litter in wooded locations.

When egg masses were collected in November, a few live adult parasites were found sitting on some of the egg masses. In the lab, parasites emerged from the eggs and were tentatively identified as *O. kuwanai*.

Counts of seven egg masses revealed parasitism rates of 7-70%.

III. European Pine Sawfly Virus Project

In May, researchers from the Northeast Forest Experiment Station in Hamden, Connecticut, requested help collecting European pine sawfly. The insects were needed to produce a supply of nuclear polyhedrosis virus to be used in tests necessary for registration of the virus as a pesticide. On June 1, personnel from the University of Wisconsin, Entomology Department and DNR Forest Pest Management Section collected the larvae near LaGrange in Walworth County (SW¼, Sec. 10, T4N, R16E). Thirty thousand fourth and fifth instar larvae were collected in about 18 man-hours into paper grocery bags and flown to Hamden.